

ABSTRACT

This disclosed invention concerns improvements in forewarning of critical events via phase-space dissimilarity analysis of data from mechanical devices, electrical devices, biomedical data, and other physical processes. First, a single channel of process-indicative data is selected that can be used in place of multiple data channels without sacrificing consistent forewarning of critical events. Second, the method discards data of inadequate quality via statistical analysis of the raw data, because the analysis of poor quality data always yields inferior results. Third, two separate filtering operations are used in sequence to remove both high-frequency and low-frequency artifacts using a zero-phase quadratic filter. Fourth, the method constructs phase-space dissimilarity measures (PSDM) by combining of multi-channel time-serial data into a multi-channel time-delay phase-space reconstruction. Fifth, the method uses a composite measure of dissimilarity (C_i) to provide a forewarning of failure and an indicator of failure onset.